Managing the Development of Technology-Based Courses: Success Factors From Eight Department of Defense (DoD) Training Courses

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Introduction

The distance education literature reports many success factors common to managing the development of technology-based university-level courses. Commonly cited success factors include effective use of changing technology, acquiring sufficient resources for development and operation of distance courses, creating effective course designs, effective staffing, conducting sufficient planning, accommodating the needs and characteristics of instructors and students, and acquiring sufficient technical expertise. Much of the existing literature focuses on technology-based traditional university training. In contrast with traditional university programs, technology-based professional training and certification programs face unique challenges, such as the requirement that sponsoring organizations pay student salaries while the students use the learning technologies. Also, the training investment is expected to transfer directly into job performance. Thus, incentives to create effective learning environments are very strong in professional programs.

Defense Acquisition University (DAU) provides professional education for the U.S. Department of Defense Systems Acquisition Workforce. More than 15 technology-based courses have been developed by DAU. Collectively, over 20,000 persons graduate annually from these courses. Annual graduation rates for each course range from several hundred to nearly 10,000 students. This study investigated success factors for managing the development of technology-based courses. The research team attempted to identify success factors that might be relevant to DAU courses. In order to pursue this research goal, a literature review of success factors was conducted, followed by a study of eight successful DAU technology-based courses. The eight courses studied were considered successful based on favorable student and instructor feedback, meeting or exceeding projected enrollment numbers, and high levels of management and stakeholder support. The courses studied range from lower level courses taken online with no required instructor interaction to higher level courses using sophisticated threaded storylines and hybrid (online and classroom) components. One course uses conference calls and an online forum tool to create a "virtual classroom", combining the convenience of "anywhere" with real-time instructor-student and student-student interactions.

The researchers used success factors described in the literature to help guide the data collection. The literature provided a rich background for the study of the successful DAU courses. After the literature review, interviews were conducted with the DAU course directors, followed by analysis of data. The success factors identified in the literature review were then compared with success factors identified by DAU course managers. The study provided a strong grouping of success factors that should apply to

DAU as well as to the management of other government and traditional higher-education distance learning programs.

Review of Literature

To simplify review of the immense body of literature related to distance education, the selection criteria for the literature search was very narrow, focusing on reports of success factors for the management of distance education development projects. The search favored empirical results from controlled studies where possible. Additional literature that reflected collection of data from experienced distance educators was also included. All items reviewed had some discussion related to success factors for the management of distance education development programs. After a preliminary review, several of the items were reviewed in-depth, leading to an identification of general categories along with some specific success factors (Alexander et al., 1998; Lopez and Nagelhout, 1995; Bates, 2000; Brigham, 1992; Volery, 2001; Wagner, 1995).

Robinson's (2001) summary of common problems related to innovation with on-line distance learning provided a useful categorization of success factors. Based on the experience of 426 distance educators, Robinson classified distance education course issues related to innovation, leading to the four general categories of *resource availability, organizational issues, human resource capacity*, and *technology capabilities*. These four categories of innovation problems comprised a convenient organizer for the success factors found in the literature. Table 1 lists the success factors identified in the literature review, sorted according Robinson's categories (2001).

Table 1 – Literature Success Factors by Category

CATEGORY	SUCCESS FACTORS
Resource Availability	Sufficient fundamentals: time, funding and personnel Proper infrastructure for technology support Use of deadlines to help manage resources Reasonable project scope
Organizational Issues	Involvement of appropriate organizational levels Appropriate organization for technical support Adequate coordination and administration practices Organization-wide strategies for the use of technology in teaching and learning Organizational support for learners and instructors Attitudes toward use of technology
Human Resource Capacity	Produce and support learning technology Apply systematic and analytical methods Think through and plan the details required for distance learning Ability to address specific student needs Use the technology to enhance learning in new ways Use a sound and well-integrated instructional strategy Provide learner support Design assessments appropriate for technology-based delivery Staff training/development in technology where needed
Technology Capabilities	Adequate technical support Software testing expertise available Software development expertise (where relevant) Copyright issue resolution Adequate / equitable student access to hardware and software Ability to absorb extra technology-related costs

Data Collection Method

The research design was largely qualitative, with a guided interview as the primary means of data collection, followed by data analysis and a correlation of findings with the success factors identified in the literature review. The interview protocol was designed to facilitate exploration of the course managers' experiences with general issues identified in the literature review. Thus, the literature review was used to help construct the data collection protocol. The protocol questions were designed to provide field-based inputs from the eight DAU developmental course managers, facilitating a comparison of their experience with the success factors identified in the literature review. The courses covered a range of subjects including management of acquisition programs, funds management, management of system testing, and software systems acquisition. The interview method was face-to-face sessions with some follow-on contact for elaboration where needed. A standard qualitative review process was followed for the analysis of data including review of interview transcripts with identification of key points, organization of key points into the main themes, selection of the most frequent themes as the candidate success factors, and review of the findings by a course manager. A post-hoc analysis was conducted to correlate the success factor data with the results of the literature review.

Results and Findings

The interview protocol was tested with an initial interview. All interview sessions were managed to make sure that each protocol question was addressed. The interviews were recorded and transcribed for analysis. The analysis of data included a review of the transcripts for identification of key points made by the course managers. The initial review produced 99 independent candidate success factors which were grouped in categories according to logical themes. The final theme categories were *management issues, development process issues, human resource issues, course design issues,* and *technology issues*. Next, an additional layer of themes was identified, creating sub-categories within the categories. The top 10 sub-category themes were selected as candidate success factors based on high levels of occurrence. These top 10 themes are not inclusive of all of the 99 issues raised, but they were the most recurrent themes across the DAU courses. The final list of success factors emerging from the data, organized by the final theme categories studied, is illustrated in Table 2.

Table 2 – DAU Success Factors by Category

CATEGORY	**DAU SUCCESS FACTORS**
Management Issues	Project Planning and Management Techniques Integrated Development Team
Development Process Issues	Effective Blending of Technology Alternatives (also a technology issue) Effective use of Testing and Evaluation
Human Resource Issues	Staffing and Team Issues Availability of SME time
Course Design Issues	Selecting a Motivating Instructional Strategy Consideration of learning variables
Technology Issues	Configuration Control (also a development process issues) Long-term technology support

These 10 DAU success factors were then reviewed and rated by importance to each DAU course included in the study, based on the data collected. A rating of 1-5 was assigned to each success factor for each course in the study. The ratings were tabulated, and the success factors were then ordered by importance. The following success factor list is sorted in tabulated order of importance to the DAU courses. A description of each success factor is also included in the list:

1. *Configuration Control* – This includes document control, harmonizing design and development versions, ensuring that source documentation exists for all on-line materials. All course managers had to come up with a way to successfully manage configuration control issues.
2. *Effective Blending of Technology Alternatives* – This includes analysis of available technologies, use of the most efficient mix of technologies, classroom sessions, on-line courseware, and others, and consideration of future changes driven by new technology.
3. *Staffing and Team issues* – This includes the optimal team composition, a positive and supportive work culture, protecting the team from distractions, co-location of team members where possible, staff selection issues, and careful selection of working team member combinations.
4. *Availability of Subject Matter Expert (SME) Time* – In several cases the classroom culture of the faculty made it difficult to get dedicated SME support for online course development, but all course managers were able to eventually get the necessary support.
5. *Project Planning and Management Techniques* – This involves defining requirements for learning objectives before finalizing the course design, making management tradeoffs to achieve the optimum balance between quality and schedule, and using baseline measures to track course performance.
6. *Effective use of Testing and Evaluation* – This includes early usability testing, prototype demonstrations for organizational stakeholders, formative testing during design, and testing by both instructors and students.
7. *Integrated Development Team* – This includes building an integrated design and development team with a functional group review and decision-making process, as well as early inputs from all team members on critical design decisions.
8. *Selecting a motivating instructional strategy* – This is particularly critical for courseware and online interactions. Effective strategies used at DAU include the use of problem-based and scenario-based training mechanisms, including the use of elaborate stories as an instructional vehicle.
9. *Long-term technology support*– This includes long-term technology planning, consideration of future requirements for interoperability, ease of maintenance, and compatibility of courseware with future releases of browser "plug-ins".
10. *Consideration of learning variables* – This includes many factors such as planning adequate student time for course completion, matching the course level with the students' level of preparedness, and providing efficient and usable resources to the students.

Discussion and Conclusions

The goal of the study was to identify success factors that might be relevant to DAU courses. The literature review produced an empirically derived group of success factors that guided development of the data collection protocol. Interviews with the eight DAU course managers confirmed that success factors in the literature were generally involved during their course developments. The interviews also provided an independent group of DAU success factors. Both the literature and the DAU success factors address issues related to human resources and technology. The success factors from the literature review focused on organizational issues, while the DAU success factors addressed more general project management issues. The DAU list added several success factors that were important to the DAU course managers, but were not emphasized in the literature reviewed. These included configuration control, availability of SME time, the use of an integrated development team, and the blending of strategies and technologies. Taken together, the combination of the literature review and the DAU success factors are a reasonable group of issues for both new and existing managers of technology-based development programs to consider. Some of these success factors may be more applicable to specific institutions, and the interview data from the study suggest that the professional workforce training focus of the DAU environment may be responsible for the identification of the additional success factors. Future research should elaborate on the role of these additional success factors and clarify mechanisms for their application in ongoing distance education development projects.

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Author Biographies

John Bennett, M.S., is a retired Navy pilot and DoD program manager. Mr. Bennett has been directly involved with the design, development, and implementation of DAU technology-based courses for over 6 years. His experience across several course developments includes online instructing, providing subject matter expertise, and managing distance learning design and development.

Ellen Bunker, Ed.D., has conducted distance learning research, design, and consulting activities for the World Bank, International Monetary Fund, United Educators, American Center for the Study of Distance Education at The Pennsylvania State University, and Brigham Young University, as well as a number of small organizations. She is currently a distance learning researcher for Instructional Systems Research & Development, Inc..

Kurt Rowley, Ph.D., has worked as a systems consultant, college instructor, software engineer, instructional designer and researcher, including work as a post-doctoral research associate at the U.S. Air Force Research Laboratory's Human Effectiveness Directorate. He is currently a cognitive training systems researcher and developer for Instructional Systems Research & Development, Inc.